

fatty acids and glycerin, resulting from the decomposition of the natural saponification-product during digestion; they are almost identical with the similar compounds separated from butter by the means now in use for analyzing butter. In order to estimate the proportion of volatile oil in the fat extracted from these glands, the author uses potash and alcohol for saponification, and decomposes with dilute acid (sulphuric or hydrochloric). This being accomplished in a retort, the condenser is luted tight, and the aqueous liquid distilled over until an exact fourth is left, to which fresh water is added, and the distillation continued as long as the water condensed gives any acid reaction. Baryta-water is added to the distillate, and the whole redistilled down to about 5 per cent of its original bulk, after which it is evaporated to dryness in a vacuum at 45° . The barium salts thus obtained are in triplicate, one series being soluble, the intermediate salts less so, and the third somewhat difficult of solution. Since the author has not yet succeeded in separating these salts, each in sufficient purity from the others, he cannot speak with certainty as to their exact identity with the caprates, butyrates, caprylates, and caproates of butter; but he can confirm the presence of caproic acid, caprates, and caprylates by the crystalline form and other appearances of these salts. It is further stated that a considerable quantity of volatile and soluble fatty matter may be found during the digestion of fat in the intestine, and particularly at the time of absorption. From this the author was induced to conclude that the transformation of a portion of neutral fats into fatty acids and glycerin by the pancreatic and other digestive fluids is the result of fermentation.—*Analyst*.

THE POISON OF THE COBRA DE CAPELO.

By A. W. BLYTH.

THE poison, which may be obtained by pressing the parotid glands, while the fangs are erected, over a watch-glass, is an amber-colored, syrupy, frothy liquid, of sp. gr. 1.046, and of feeble acid reaction, drying rapidly on exposure to air, leaving a yellow, acid, pungent powder, to the amount of about 33 per cent. The poison contains albumen, a minute quantity of fat, and 1.4—1.5 per cent of ash, mainly consisting of sodium chloride, is obtained on incineration; it is not decomposed at 100° , and the uncoagulated portion preserves its activity for a long time. On heating the yellow powder to 270° , it blackens, and above 270° a sublimate is formed. A similar substance, crystallizing in needles, may be obtained by dialyzing the poison. It exists in the venom to the amount of 10 per cent, and is highly poisonous, appearing to be the only active principle. It is obtained pure by means of the lead-salt, and evaporation in a vacuum. For want of material no analyses have been made, but the name of *cobric acid* is proposed for it. A dilute solution of potash, or a weak alkaline solution of potassium permanganate, destroys the poisonous properties of the cobra poison.—*Analyst*.

THE FUNCTION OF CHLOROPHYLL.

By R. SACHSE.

SINCE Bayer has discovered that furfural, when mixed with resorcin or pyrogallol, gives with a trace of hydrochloric acid a beautiful indigo-blue substance, and surmised its identity, or at least analogy, with chlorophyll, the author has repeated Bayer's experiments, with the following results: Pyrogallol is dissolved in alcohol; hydrochloric acid and ferric chloride are added, and finally some furfural. The fluid slowly turns green, and keeps its color for a long time. Finally, however, turning brown, with a tinge of violet. The absorption-spectrum of this color shows a tolerably well-defined band in the red, while blue and violet are almost wholly absorbed, the band being nearly coincident with the line I of chlorophyll. It has been supposed that the function of chlorophyll in plants was to absorb light and convert it into vital force. But the unabsorbed light, viz., yellow, is most energetic in decomposing carbonic anhydride; besides, chlorophyll is continually being formed and destroyed. Several theories have been advanced on this subject. Wiesner supposes chlorophyll to be the active agent in reducing carbonic anhydride, and attempted to reduce that substance by passing a current through a solution of chlorophyll in alcohol.

Kraus supposes a body, which he calls leucophyll, to combine with aldehydes, which are reduction-products of carbonic acid. This compound is continually destroyed, and leucophyll again formed, when the reaction again takes place. Timiriaseff's hypothesis is that a substance, called by him *chlorophyllin*, is changed by light into a brownish-yellow body, *phylloxanthin*, oxygen being evolved, and replaced by carbonic oxide formed by reduction of carbonic anhydride, and the color being restored. The author of this paper believes that chlorophyll is the first product of the reduction of carbonic anhydride and water, and is itself converted by further change and reduction into starch and carbohydrates. This accounts for the circumstance that, when starch is in course of formation, the amount of chlorophyll diminishes. Wiesner also draws attention to the fact that, in young *orabanchacea*, starch is converted into chlorophyll as the plant grows older. Hoppe has recently shown that pyrocatechin is a derivative of carbohydrates, and furfural has long been known to be connected with them.

The author's views stand in opposition to Wiesner's experiments, which tend to show that chlorophyll in alcohol solution is destroyed by light and oxygen, but he maintains that this may not express the reaction which occurs in the living plant, for almost all colors may be destroyed by bleaching, and the color of chlorophyll is also destroyed by reduction. The synthetical aim is, therefore, to convert chlorophyll into carbohydrates. Should this be accomplished, we shall be better able to understand the formation of these substances from their elements.—*Chem. Centr.*

HEAT IN THE SILVER MINES.

THESE who have never personally inspected the lower levels of our mines may obtain some idea of the degree of heat to be found therein by visiting the Savage works at the change of shifts. The men—packed together as close as they can stand on the cage—are popped up out of the shaft all steaming hot, for all the world like a bunch of asparagus just lifted from the pot. They make their appearance in a cloud of steam that pours up continually from the "depths profound," and are dimly seen until they step forth upon the floor of the works. As the men land and separate, each carries with him for half a minute his little private cloud of vapor. As this passes off the man is seen to be naked from the waist up, his skin as wet as though he had just been

lifted out of a pool of water. The men bring up with them—besides the steam—an amount of heat that may be felt by the spectator as they pass.

All this is at the top of the shaft, where it is considered quite cool—what, then, must it be hundreds of feet below, where the men started from—down where the water stands at 157° Fahr? Down there no steam is seen—it is too hot for it. It is only when the hot, moist air coming up from the lower regions strikes the cool air towards the top of the shaft that it takes the form of steam. Down where the men come from you must keep your hands off the pump column and the pipes, and if you pick up any iron tool you will at once put it down without being told to do so. Down there they handle things with gloves on, or wrap rags about the drills they are guiding and iron apparatus they are moving, and down there, too, you will learn to keep your mouth shut after you have drawn a few mouthfuls of hot air into your lungs.

Perspire? It is no name for it. You are like a sponge that is being squeezed. You are ready to believe that you have ten million pores to every square inch of surface, or as many more as any authority may mention, and that all these pores are as big as the cells of a honey-comb. You go for ice water, and it almost seems to hiss as it passes down your throat—you keep going for it, and thus, in a short time, find out what becomes of the tons and tons of ice that are daily consumed in the mines. Remain below among the miners for an hour or two, and when you are finally popped out at the top of the shaft, all red hot and steaming, among the other asparagus sprouts, you will appreciate the beauty, the light, and the coolness of the upper world.—*Virginian Enterprise*.

BUBBLES BY HEAT.

By WALTER NOEL HARTLEY.

THE paper deals with the bubbles in fluid cavities of crystals, and their behavior when a source of heat is brought near them. A long course of experiments has revealed the following facts:

1st. That the bubbles in fluid cavities of minerals are sometimes attracted by a source of heat.

2d. That bubbles are sometimes repelled by the same source of heat.

3d. That a rise of 5° or 6° C. above the temperature of the specimen suffices to cause attraction.

4th. That a rise of only $\frac{1}{2}^{\circ}$ C. will in certain cases cause repulsion.

5th. That in certain cases the same bubble was repelled under ordinary conditions, but when its temperature was raised to 90° it was attracted, the source of heat being from $\frac{1}{2}^{\circ}$ C. to 5° warmer than the specimen.

6th. That this could occur in cavities containing liquid carbonic acid as well as water, but that it made no difference whether the carbonic acid was raised above the critical point or not. This affords a means of controlling to some extent the conditions of the experiments, since carbonic acid at a temperature just above its critical point has a tension of 109 atmospheres.

The author shows reasons for not being satisfied with Prof. Tait and Swan's explanations of the movement of bubbles in Iceland spar, noticed by Mr. Lang, of Edinburgh. He stated that the warmth of the fingers is sufficient to propel even in a vertical direction a plug of water contained in a capillary tube open at both ends, and he refers the attraction of bubbles by heat to the same cause which occasions this movement. In communications addressed to Mr. Hartley, Prof. Stokes states that this repulsion of the liquid is due to the diminution by heat of the surface tension at one end of the plug of liquid in a tube or side of a bubble in a cavity.

When repulsion of a bubble, or attraction of the liquid, takes place, it is because a slight rise in temperature effects a disengagement of gas from the water on the side of the bubble nearest to the source of heat, which increases the surface tension at this side: the bubble is therefore propelled in the opposite direction. Considering that these explanations may meet every fact which he has noticed, the author has abandoned his own theory with regard to this movement. Those who have given great attention to the study of fluid cavities in minerals are acquainted with the occurrence in some granites, and other quartzose rocks, of minute vibrating bubbles. Sometimes they have been seen floating on liquid carbonic acid, but under such conditions they are very rarely met with. They vary in size from $\frac{1}{1000}$ to $\frac{1}{100}$ of an inch in diameter, the more minute bubbles having the most rapid motion. They always move over to the warmer side of the cavities in which they are contained, and any appreciable rise of temperature causes them to cling to that side for a considerable time, quite motionless. Since all substances are continually gaining and losing heat, it is impossible to imagine a body which, throughout its entire mass, and at the same instant of time, is one of uniform temperature. It is evident, then, that an easy movable particle of very minute size, which can be set in motion by exceeding slight rises of temperature, may make the transformation of heat from one point to another plainly visible; hence these vibratory motions are considered to afford an ocular demonstration of the continual passage of heat through solid substances.—*Proc. Roy. Soc.*

THEORY OF COLORS APPLIED TO THE ARTS AND TO INDUSTRY.

This is a notice given in the *Moniteur Scientifique*, of a work by Prof. Bezold of the Polytechnic School of Munich, an English edition of which has been brought out in America. The author objects to Chevreul's arrangement of colors, and maintains that the principle of the chromatic color does not agree with the laws of the mixture of colors. "In fact the admixture of black is equivalent to a decrease of intensity, for the abated colors obtained by this mixture may also be obtained by illuminating more and more feebly a surface painted with a pure color. We know that when the day declines all colors darken and become converted into black. But, on the other hand, an admixture of white is not equivalent to an augmentation of intensity, for the whitened colors are not pure colors intensified; they are colors imperfectly saturated. M. Chevreul confounds under the name of 'ton' two modifications essentially distinct. The chromatic circle also does not contain the gamut of white, i. e., the series of greyshades which represent the mixtures of white and black, nor do we find in it the mixture of the colors with white and black at once. An attempt has been made to correct this imperfection of the chromatic circle by adding nine chromatic circles uniformly lowered with black, but in this manner many colors are necessarily repeated several times in the successive circles." M. Bezold proposes to revert to the "chromatic cone" of Lambert, the construction of which agrees with the princi-

ples established by Helmholtz and Maxwell. On these principles every sensation of color depends on the factors by which it is completely determined; for these we may take: 1. A pure color defined by its wave length (Chevreul's *nuance* and Helmholtz's *ton*). 2. The luminous intensity of this color, which may be determined by the quantity of black to be added to the normal shade. 3. The degree of saturation or of purity, which depends on the quantity of white to be mixed with the normal color. To obtain all the colors possible it is needful to form a chromatic circle with a certain number of distinct colors distributed on the extreme circumference, and degraded successively by admixture with growing proportions of white, to the center which is occupied by white. We then form a similar series of circles by successively diminishing the luminous intensity of the colors contained in the first by an admixture of black. For the colors to be placed on the circumference of the circle M. Bezold takes in the outset the following ten, which form five pairs of complementary colors: Red and green-blue; orange and blue; yellow and ultramarine; yellow-green and violet; green and purple. The wave-lengths of the two complementary colors are to each other about 4 to 5; but we remark that the purple, a compound color not existing in the spectrum, is not defined by its wave-length. M. Bezold admits that the difference between the yellow-green, the green, and the blue-green is much less sensible than that which exists between their complementary colors, violet and purple, or purple and red. He therefore subdivides the violet into blue-violet and purple-violet, and the red into carmine and scarlet, thus obtaining a scale of twelve equidistant colors.

ELECTROSILICIC LIGHT.

By G. PLANTE.

WHEN a platinum wire crosses a capillary tube filled with a saline solution, and a current of electricity caused by 60 to 250 to 300 secondary couples (depending on the nature of the salt) is passed through the wire, the glass fuses, even in contact with the liquid, and emits a dazzling light. When the knob of platinum has become coated with a glass, it is isolated from the liquid, and the light disappears. With a solution of salt, 250 to 300 secondary pairs are necessary: with nitre, 60 pairs equal to 90 Bunsen's cells. The intensity of this light depends on the nature of the silicate (glass), which is devitrified by the heat, while a light vapor with slight alkaline reaction is evolved. The spectrum of the light is not that of the lime combined with the silica; a fragment of calc-spar under the same circumstances gave a calcium spectrum. The rays of silicon are so weak as not to be visible through the very bright continuous spectrum, in the same way as the spectrum of carbon is not visible in the incandescence voltaic arc.

But that silicon is the cause of the light is shown by its formation with crystals of pure silica, and it probably arises from the incandescence of silicon liberated from the silica by the intense heat.—*Compt. Rend.*

CARBON POINTS FOR THE ELECTRIC LIGHT.

By F. CARRE.

ATTEMPTS were made to impregnate the carbon terminals with various salts, in order to modify the light. The following results were obtained:

1. Potash and soda double the length of the electric arc, and render it silent; they combine with the silica contained in the carbon, and the silicate is deposited in the form of vitreous globules at 6 or 7 mm. from the points. These substances increase the light in the ratio 1:25:1.

2. Lime, magnesia and strontia increase the light in the ratio 1:3—1:5:1, with production of various colors.

3. Iron and antimony cause an augmentation of light in the ratio 1:6—1:7:1.

4. Boric acid increases the hardness of the carbon points, but does not increase the light.

The manufacture of carbon points by impregnating pure and homogeneous charcoal with solutions of the above substances is convenient and economical, but it is better to mix the substances with the charcoal in powder.

In the latter case the carbon is purified by washing, etc.; it is then mixed with the salt, moistened with a solution of gum, and pressed through a wire-drawing machine by means of a powerful hydraulic press.

The carbon terminals thus made are very superior to those obtained from gas carbon; they are very tenacious and rigid, and being perfectly homogeneous, the light obtained by their means is much less liable to variation; further, they do not explode when ignited, as there is no enclosed gas.

AN ANCIENT SPECIMEN OF TIN.

By PROF. A. H. CHURCH.

TOWARDS the close of the year 1875 a mummy, which had been recently brought from Egypt by Lord Eustace Cecil, was unrolled under the superintendence of Mr. R. H. Soden-Smith, of the South Kensington Museum. Beyond a strip of white metal nothing was found within the cloths of the embalmed body. This strip of metal was embedded in pitch resting on the breast in contact with the flesh—the usual position of the scarabæus emblem. It was destitute of all ornament or engraving, but presented the outline of the winged scarabæus, in the form of which it would have been fashioned had the mummy been of the first class, such a scarabæus being an emblem of immortality among the Egyptians. The date of this mummy must be placed not later than 600 or 700 B. C. It became of interest to ascertain the nature of the metal of which the small plate was composed. On making a qualitative testing of a small fragment it proved to be pure tin, neither lead nor silver being detected. As sufficient material for a complete analysis could not be appropriated, an exact determination of the specific gravity of the specimen was made. The figure thus obtained was 7.369 at 16° C., a number very near that of pure tin, namely, 7.29 to 7.373.

In the British Museum, the Louvre, and the Egyptian Museum at Turin, there are several small oblong and square plates of metal which have been likewise found in unrolling Egyptian mummies. Where labeled they are generally described as "silver," "lead," "white metal," or "mixed metal," and in most cases appear to contain, if not to consist of, lead. That the ancient Egyptians were familiar with some of the uses of tin—as in enamels and bronzes—has long been known; that they were acquainted with tin in a state of chemical purity would now seem to be established.

The strip of tin weighed 4.031 grms., and was about 0.3 millimetre thick, 93 mm. in length, and 16 mm. in breadth.—*Chemical News*.